CIOB Global Student Challenge - Integration into Professional Financial Training

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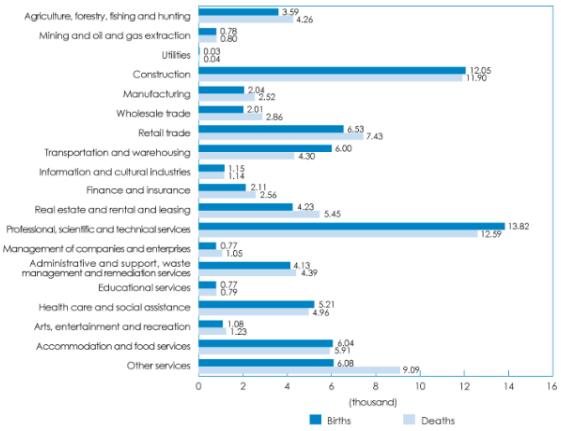
As anyone in the construction industry knows, a construction business is one of the most risky to start compared to any other industry. This does not mean that it should be avoided by potential entrepreneurs, just viewed with a more cautious eye than other industries. Those considering entering the industry should have experience and confidence in their ability to perform prior to the establishment of a company. One way to gain this experience is through years of work in the respective sector. Another, more experimental method, is through the use of competitive virtual training. The latter requires less training time and can be very effective if administered in an appropriate fashion. These training sessions can be focused on relatively inexperienced professionals with the intent of venturing off on their own. An adaptation of the CIOB Global Student Challenge would be an effective tool for this goal.

Keywords: Virtual Reality in Education, Construction Management, Financial Management, Professional Training

Introduction

As anyone in the construction industry knows, a construction business is one of the most risky to start compared to any other industry. This is due to the little barrier of entry and the ease of access to work. As seen in a 2013 study done by the Government of Canada (Figure1), small businesses in the construction industry had the second highest number of "births" and "deaths" of any industry, behind that of tech companies. Not only is the barrier of entry part of the cause for the tremendous amount of construction companies in the market, but a potentially more influential factor is the relatively low requirement for qualifications needed to start a construction business. This could be seen as both a positive and a negative aspect of the industry. On one hand, a self employed contractor can provide services for a client on a small scale and excel on these size projects, creating more competition and lowering prices. On the other hand, it can also create an environment in which customers are putting themselves at risk by trusting the qualifications of a contractor until their project is in the red. A qualified contractor would be required to be able to complete the project to the expected degree of quality while at the same time managing the costing and billing of the client, subcontractors and suppliers simultaneously. The need to maintain an adequate cash flow is often the downfall of a small construction company because of the delay between purchasing, billing and payment.

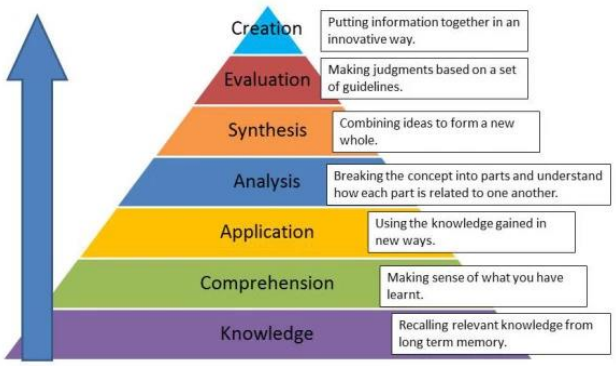


Source: Statistics Canada, Entrepreneurship Indicators Database.

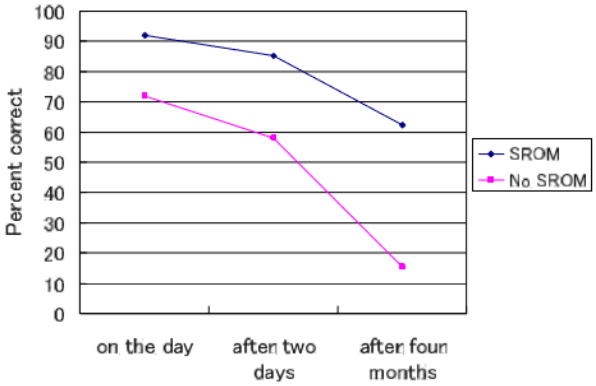
Financial management is one of the key roles of a construction project manager, these skills need to be elevated to another degree in order for a project manager to have the confidence to journey into the land of business entrepreneurship. The Cal Poly Construction Management curriculum is very efficient at providing students with a toolbelt of important skills to be successful as a project manager. However, after professionals spend enough time in the industry to have enough construction knowledge to venture off on their own, many still lack the upper level discussion making skills required to be an executive of their own business. What is the solution? Should professionals continue to work as project managers until they have enough experience to be promoted to executive and trained within their respective companies, even though this will cost them valuable time at pursuing their true goal of entrepreneurship? Is there another option? Many institutions have integrated virtual education software into the curriculum and have seen positive results.

Background

When considering financial management of a construction company as the focus of a course curriculum, it is important to recognize the degree of understanding required by the student for the educational process to be effective. Financial management is a complex process with many different aspects coming together to influence the bottom line of an organization. Familiarizing oneself with the many different situational possibilities is key to the educational process. Bloom's Taxonomy is a universally used hierarchy that evaluates the effectiveness of a student's education and their ability to use the information learned. Within Bloom's Taxonomy (Figure 2), there are six, sometimes seven stages of understanding. Our need for understanding of the financial decision making process places student understanding at the highest levels of the taxonomy, Evaluation and Creation. In order to provide an evaluation level of understanding to students, the curriculum must allow them to analyze a large amount of financial outcomes and come to their own conclusions about these outcomes.



When it comes to the retention of information, it has been proven that virtual reality can aid in the cognitive process and strengthen the ability to memorize key concepts. This can have a strong impact on the long term effectiveness of a curriculum. A study done by Michael J. Smith and Gavriel Salvendy proved this statement by testing retention with the use of virtual reality as opposed to without. The graph on the right (Figure 3) shows the difference. This study provides clear evidence of the effectiveness of the usefulness of virtual reality in the training process.



Literature Review

When researching the advantages and disadvantages of learning through virtual reality, an article by Veronica S. Pantelidis, titled "Reasons to Use Virtual Reality in Education and Training Courses and a Model to Determine When to Use Virtual Reality", pointed out that the aptitude of the user has a large amount of influence on the success of the training program. (2009) When considering an application for Virtual Reality in Construction

Education, it is important to recognize the type of individual that would be attending the sort of crash course training program that I am advocating. These individuals would most likely have a large amount of hands on construction training, however a large majority might lack the technological familiarity to be able to navigate the program effectively. It is not always the most appropriate to use virtual reality in education. In some instances, as depicted in the table below, it is more harmful to use this new technology than to use traditional forms of education. This is due in a major part to the complexity of the process used to integrate virtual reality into a classroom environment. Specific examples of instances in which Virtual Reality is appropriate and not appropriate were presented in Veronica S. Pantelidis's article and are described in Table 1.

Table 1

When to Use Virtual Reality in Education	When not to Use Virtual Reality in Education
● simulation is possible ● the real thing is too dangerous, impossible, inconvenient, or difficult to use for teaching or training ● a simulation and the real thing are interchangeable ● interacting with a model is as motivating as or more motivating than interacting with the real thing. ● shared experiences of a group in a shared environment are important. ● the experience of creating a simulated environment or model is important to the learning objective. ● information visualization is needed, manipulating and rearranging information, using graphic symbols, so it can be more easily understood. ● a training situation needs to be made really real. ● needed to make perceptible the imperceptible. ● developing participatory environments and activities that can only exist as computer-generated worlds. ● teaching tasks involving manual dexterity or physical movement. ● essential to make learning more interesting and fun. ● mistakes made by the learner or trainee using the real thing could be damaging	● no substitution is possible for teaching/training with the real thing. ● interaction with real humans, either teachers or students, is necessary. ● using a virtual environment could be physically or emotionally damaging. ● using a virtual environment can result in "literalization" (Stuart, 1992), a simulation so convincing that some users could confuse the model with reality. ● virtual reality is too expensive to justify using, considering the expected learning outcome.

For those individuals that take the time to participate in the hypothetical crash course for financial management, it is important that they remain completely focused on the task at hand. Many entrepreneur personality types find it difficult to avoid multitasking due to their high level of energy and demand for creativity to succeed. Retention has been studied while multitasking versus focusing on the immediate task and the results were as expected, there can be negative implication when the mind tries to concentrate on too many tasks at once. This is explained in an article by the Metiri Group, "this represents one of the severe limitations of human thinking processes, for short-term memory is thought to be limited to approximately four objects that can be simultaneously stored in visual/spatial memory and

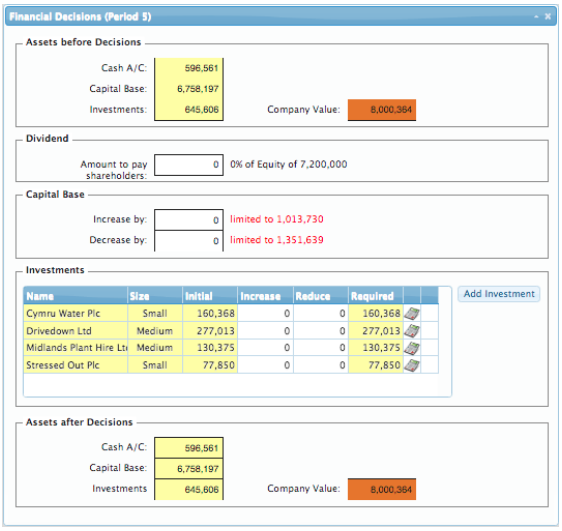
approximately seven objects that can be simultaneously stored in verbal short-term memory. If those buffers are full and the person shifts attention, new elements may be introduced into working memory causing others to disappear from thought/consciousness. Within working memory, verbal/text memory and visual/spatial memory work together, without interference, to augment understanding. Overfilling either buffer can result in cognitive overload." This can be an issue for a program that focuses on individual interactions with the virtual software, seeing as the individuals will most likely require instruction while working with the unfamiliar program. At the same time the multitasking individual will have to work in the program as well as most likely thinking about their normal day-to-day activities.

Research Methodology

The research for this Case Study consisted of the personal experience of the author as well as experience from industry professionals who have started and run their own General Contracting business, C.A. O'Reilly & Associates. In order to provide sufficient personal experience in the training of financial managers, the author participated in the CIOB Global Student Challenge. This challenge consisted of a team of four Construction Management students, by the name of SLO Construction, that were tasked to run their own virtual construction company. Over the span of six weekly rounds, the team was involved in high level decision making and management for shareholder interests, marketing, job costing, and schedule in an effort to establish the best virtual company. Participants were scored on key performance indicators like company value, gross profit to turnover ratio and share price to decide which companies performed best. These teams were broken down into four positions: financial manager, construction manager, marketing manager, and estimating manager. For the purpose of this paper, the role and responsibilities of the financial manager will be prioritized.

Financial Overview

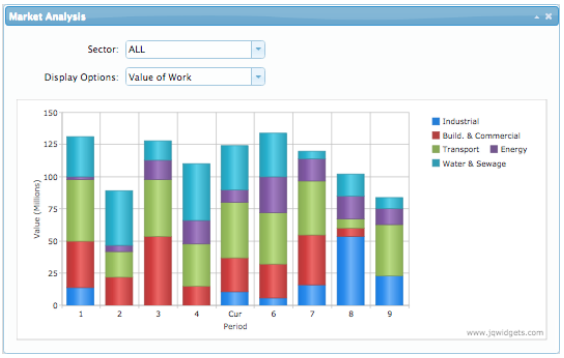
After selecting the Financial Decisions Tab on the programs menu, the operator is prompted to the figure at the right (Figure 4) for an overview of the current financial situation. The information on this window is updated periodically, in this case on a weekly basis, based on the results of the decisions of the entire management team. This information is also affected every time a new financial decision is imputed. The majority of the focus on this window is on the ratio of Capital Base to Cash. This ratio is affected by the Market Analysis and the amount of work planned, an explanation of the Market Analysis can be found later in this paper. The program creators have set guidelines for the calculation of Capital Base depreciation once sold for Cash, establishing a more realistic connection between the two.



Another important decision on this window is the ability to provide Shareholders with dividends. Every period, reports are published to the team in which the attitudes of all of the Stakeholders are presented. Whenever a dividend below 1.5% is given to the Shareholders, their attitudes are described as "negative". It is still unclear to the team how large of an effect this low Shareholder satisfaction has on the overall performance score.

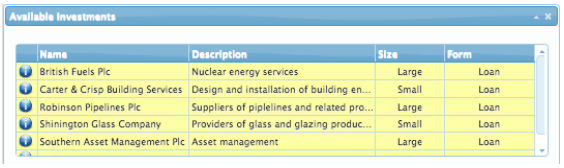
Market Analysis

The market analysis is an important tool for the teams participation in the CIOB Global Student Challenge because it allows the teams to predict the amount of work coming from specific sectors. The figure on the right (Figure 5) depicts the Market Analysis window. The values in the graph represent the value of work in the entire market, this does not mean that all of the work in the market will be available to every team so there is some unpredictability in the program. The values of each different sector helps the teams to decide what kind of investments will be most desirable in the coming periods.



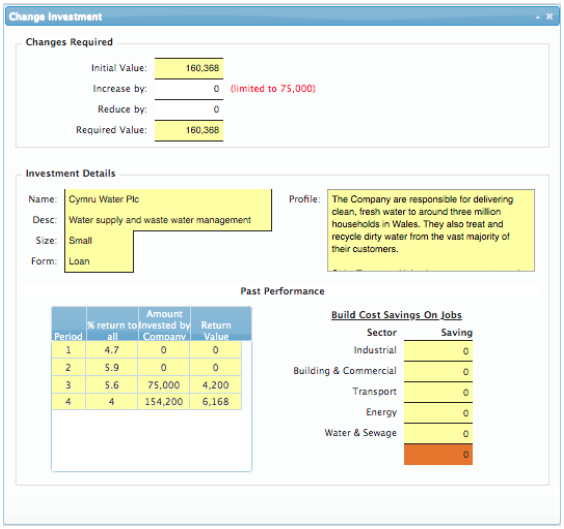
Available Investments

When deciding which investments are most appropriate for the company, the teams are presented with a list of potential investees. These companies are categorized by the size of investment and by the sector that they perform work in. Within each description of the companies, they have the results of past investments as well as a description of the type of work and products provided.



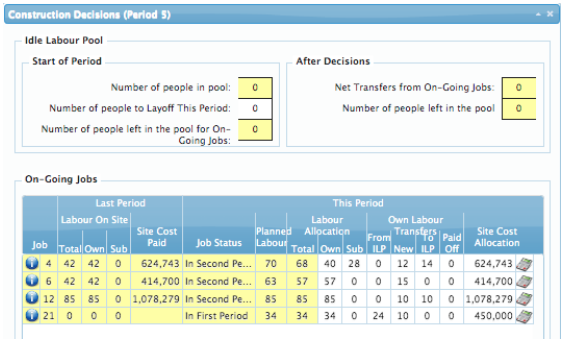
Investments

Investments are classified by size, this does not mean the size of initial investment. This means that after a certain amount of capital is invested, the investor can receive savings on projects that are in the same sector as the investment. There are three types of investments: small investments require $100,000 to obtain benefits and have a limit of $50,000 per period, medium investments require $200,000 and have a limit of $100,000, and large investments require $300,000 and have a limit of $150,000. It is unclear what value is put on the success of these investments when it comes to a score for the competition or whether these investments play a role in the success of projects that acquire the "Build Cost Savings" through the company.



Construction Decisions

Though the emphasis of this paper is on the Financial Management aspect of the CIOB Global Student Challenge, it is important to understand the effect that Construction Decisions have on the profitability of the company. Construction Decisions focus on the labor force distribution between projects. This labor force can either be allocated from the company's pool of trades workers or from an unnamed Subcontractor. When allocating new in-house employees to a project, it is important to adjust for training of



these recruits. If the workforce is not adjusted, the project can be delayed beyond the completion date. This delay will have a drastic effect on the company's available cash.

Research Results

C. A. O'Reilly & Associates was a General Contracting corporation that was formed in 2005 after The Beck Group left California. Two Management level employees decided to take the risk of starting their own company and target the clients left behind by The Beck Group. These two employees were Christopher O'Reilly and Steven Duhm, both had a large amount of experience with multiple General Contractors in both the commercial and residential sector. Chris also had the opportunity to manage his own residential contracting company with an experienced colleague earlier in his career. This experience helped to grow his confidence with management decisions while he had the support of his partner. Steve's experience consisted of progressing through the ranks of project management staff. After years in the industry, both professionals went back to school to gain career advantages.

The majority of work for C. A. O'Reilly & Associates came from one of these clients, leaving little diversity in the company's portfolio. The standard of comfort brought by The Beck Group was maintained between the clients and the new C.A. O'Reilly & Associates because a majority of the same practices were adopted. This led to a large amount of work and profit in the early years of existence, however this is not common for most new businesses. Most new businesses have to spend a large amount of their resources on networking to ensure a full workload and maintain company profitability. This could be perceived as a positive opportunity for C.A. O'Reilly & Associates and that would be true if not for unforeseen circumstances in the market and entire economy in 2008. When the financial crash hit, C.A. O'Reilly & Associates had little diversity of customers and market sector. In the experience of the author and the SLO Construction team during the CIOB Global Student Challenge, the company had a similar experience in which a project was pushed behind schedule and the future projects of that client were compromised. Luckily the team of students had more clients and projects available in future periods as well as in different sectors. Another side effect of the Great Recession for C. A. O'Reilly & Associates was the loss of cash availability. Cash is necessary for the success of a construction company, especially a General Contractor, because of the delay between production and payment. This was also an issue for the SLO Construction team since payments were not made during the scheduled time due to delays on the project. This delay in payment lead to a deficit of cash that was never completely resolved.

When it comes to management experience and the ability to make decisions, both Chris and Steve testified to the fact that they felt completely comfortable from the beginning of their work as C. A. O'Reilly & Associates. There were three factors that influenced this comfort level. The first was their education in accounting and business administration, respectively. Both individuals got their degrees after they had experience in the industry, this allowed them to connect their experience to the learning and helped them to retain the information. The second was their years of experience in the industry. Steve explained that he had twenty-five years of experience before the establishment of C. A. O'Reilly & Associates. He estimated that he could have been comfortable venturing off on his own after around ten to fifteen years of experience. The use of an educational simulation could have reduced the amount of experience needed even more, mostly due to the amount of confidence provided by completing one of these courses. The third major factor was the amount of support provided by their mentors. In Chris's experience, he became confident after teaming up with a previous employer to start a residential business in the years before entering the commercial industry. They created this business in the early years of Chris's career, which created a priceless learning experience for him. In a way, this experience was similar to that of the CIOB Global Student Challenge in that it was mostly a learning opportunity that allowed him to understand the basic financial process of running a construction business.

Conclusion

One major take away from this experience is the importance of maintaining an adequate ratio of cash to capital base for the current project workload. Seeing as the construction industry is a risky and competitive market with little tolerance for mistakes, it is important not to make these mistakes in the early years of a business's life. Some of these mistakes can be avoided through the use of a virtual simulation in which individuals work to make their mock company profitable for the shareholders. An adjusted version of the CIOB Global Student Challenge would be very useful for preparing industry professionals for many of the expected situations. In my opinion, some changes could be made to engage communication between the shareholders and the decision makers. The most extreme change I would make would be to integrate the competition into a weekend session so that it can be accessible to more industry professionals that might not have the time to work the whole ten week process. I would also find a location that would allow for more open dialog between the competition operators and competitors, this would create a more subjective environment but it would also allow for competitors to justify their decisions and receive vital feedback to improve the learning process. Often times, companies reduce the amount of dividends provided to the shareholders if the company has plans for expansion or foresees financial trouble. These shareholders are generally content with this decision if they trust and understand the intentions of the company.

One shortcoming of an educational course presented by Chris in an interview was the lack of incentive for the competitors. If the competition is short on incentive, many companies will not have the same "work ethic" as a real company. The incentive for the CIOB Global Student Challenge was a trip to Edinburgh, Scotland to compete in the finals. This incentive was inadequate to those in the bottom half of the competition, which became clear when teams started missing deadlines. All in all, the CIOB Global Student Challenge was educationally effective but it could be adapted to create a higher level of understanding.

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Appendix A- Interview Questions

1. What experiences prepared you most for running your own business?
2. What knowledge do you wish you had prior to starting your own business?
3. How long until you were comfortable making financial decisions?
4. What kind of mistakes were made before you were comfortable?
5. What did you learn from your experience with C.A. O'Reilly & Associates?
6. What would you change the second/third time around?
7. Did you understand the importance of having good financials? (Many construction companies focus on the end product and forget about the financial consequences)
8. Did going to school for accounting help to prepare you for this experience? What would have prepared you more?
9. What is your opinion on using a competitive virtual reality to train entrepreneurs?